SAFETY SYSTEM FOR A ROLLER GRINDING MILL AND METHOD FOR THE PRODUCTION OF CEMENT

The invention relates to a safety system for a roller grinding mill according to the preamble of claim 1, a method for operating a roller grinding mill according to the preamble of claim 5 and a method for the production of cement according to the preamble of claim 8.

It is known to use roller mills for grinding the most varied materials. DE 105 099 C discloses a roller carriage arm with a ring of milling rollers arranged over a rotary milling table and which has a frame and stands mounted pivotably on said frame. The milling rollers are resiliently mounted in the stands and can be moved outwards together with the stands and further parts fixed thereto.

DE 198 26 324 C discloses a bowl mill with milling rollers, which are pressed onto the milling pan by means of pressing pieces, pressing frames and the like. In each case two milling rollers are successively circumferentially arranged and held on a joint, multipart holder.

DE 153 958 C discloses a cone mill, in which there are eight milling cones under spring pressure on a rotating milling pan and which are mounted outside said milling pan. The milling cones can be brought individually from a horizontal milling position into a vertical position for inspection, replacement and similar purposes.

DE 197 02 854 A1 describes a method and a roller mill. Unlike in the case of roller grinding mills for crushing mineral material,

such as e.g. a cement raw material, cement clinker and the like, where the drive capacity for the crushing activity is brought about by a single drive mechanism with drive motor and gear for the rotary driving of the milling pan, the milling rollers rolling on a milling pan are driven directly and have their own rotary drive, operational fluctuations between the individual rotary drives of the milling rollers being compensated by a joint load compensating control. Three or four milling rollers are provided and if damage occurs to one milling roller or to the rotary drive a single milling roller can be moved out of the mill casing or the rotary drive thereof can be repaired or replaced, whereas the remaining two or three milling rollers continue to operate.

DE 21 66 219 A discloses a roller grinding mill with a mill gear for the milling pans and pivotably mounted milling rollers rolling thereon, each roller being individually mounted on a load bearing pedestal. A particularly advantageous solution for a rapid, simple pivoting out of the rocking lever with the milling roller is described.

Roller grinding mills, particularly air-swept mills, from the design and control standpoints and also with respect to energy consumption, environmental behaviour and overall economics offer significant advantages.

In the cement industry air-swept roller mills are used both for the production of cement raw powder and also for clinker and coal crushing. If raw material plants are operated in combination with rotary kilns and a calcining plant, the kiln waste gases from the heat exchanger and clinker cooler process can be used for mill drying and for the pneumatic conveying of the crushed cement raw material or coal.

Methods for the production of cement in a combined system with a vertical air-swept, Loesche-type roller mill for the mill drying

of a raw material mixture are described in DE 198 36 323 C2. DE-AS 23 61 060 discloses, in addition to mill drying of raw powder in an air-swept roller mill, a cooling milling of cement clinker in an air-swept roller mill downstream of a rotary kiln.

As a rule two, three and four-roller mills constructed according to a modular system are used. For the crushing of slags and mixed cements it is also advantageous to use modified Loesche system roller mills, which can be referred to as 2 + 2 roller mills or 3 + 3 roller mills. In the case of such 2 + 2 and 3 + 3 roller mills, use is made of roller pairs, comprising a precompacting roller, also called a S-roller (slave roller) and a crushing roller, also called a M-roller (master roller). Thus, in a 3 + 3 roller mill there are three crushing rollers and three precompacting rollers and in each case a precompacting roller is associated with a crushing roller. As a result of a preparation and a planned, uniform milling bed formation, a low vibration mill operation is achieved, so that higher specific milling or crushing forces are possible leading to an improved product quality (EP 406 644 B1).

In order to ensure the necessary operational safety and reliability of a cement plant in the case of a continuous rotary kiln operation through a corresponding mill efficiency, various safety concepts are known.

In a conventional safety concept two parallel roller mills are combined with a rotary kiln for raw powder processing in the case of high kiln efficiency levels. It is inter alia disadvantageous that the capital expenditure is much higher (approximately 20 to 40%) compared with a combination with a roller mill or a raw material crushing plant.

In principle, the high availability of the roller mill in the cement industry permits the most economic combination of a rotary

kiln with a roller mill. In the case of four-roller mills with rollers supported individually in rocking levers according to the Loesche system, in conjunction with an adequately high volume flow it is possible to have a two-roller emergency operation in which approximately 55 to 60% of the full load production rate and a correspondingly reduced kiln efficiency are achieved. In the case of two or three-roller mills it is necessary to shut down the milling plants.

The object of the invention is to provide a significantly improved safety system for a roller mill, particularly air-swept mill, as well as a method for operating a roller mill, particularly an air-swept mill, and a method for cement production based on such a roller mill safety system and to ensure an extremely high operational reliability of the cement plant with relatively limited capital expenditure.

With regards to the roller mill safety system the object is achieved by the features of claim 1, with regards to the method for operating a roller mill by the features of claim 5 and with regards to the cement production by the features of claim 8. Appropriate and advantageous developments appear in the subclaims and the description relative to the drawings.

A fundamental idea of the invention is to so design a roller mill that it reaches the necessary mill production rate at approximately 80% of full load.

With regards to the use of a roller mill, e.g. for crushing a raw material mixture, this means that the cement raw material plant or the raw powder mill is designed in such a way that it ensures a twenty four hour operation of the rotary kiln with approximately 80% of full load.

According to the roller mill safety system according to the invention and the method for operating a roller mill a continuous availability of at least four milling rollers is ensured by the provision of more than four milling rollers, said more than four milling rollers being arranged in pairwise facing manner and continuously four milling rollers of two milling roller pairs provide approximately 80% of the full mill capacity in a four-roller operation.

There are preferably six milling rollers and approximately 80% of the full mill capacity is achieved in a four-roller operation, so that on the milling roller side an approximately 100% redundancy is ensured.

Appropriately each milling roller can be swung out from an operating position into a service position and the mill casing is sealed in such a way that four-roller operation is ensured when milling rollers are swung out.

Advantageously, the in particular six milling rollers are positioned in accordance with a per se known modular system. According to said modular system in each case one pedestal and one rocking lever or rocker arm are provided for supporting a milling roller, as well as a hydropneumatic spring suspension system for a milling roller pair, so that with six milling rollers a 3 x 2 roller mill is constructed.

This leads to the advantageous possibility of being able to further operate the roller mill in the case of breakdowns or damage to the milling rollers, rocking levers or spring suspension systems with four milling rollers following a brief stoppage and swinging out of one milling roller pair, so that 80% of the full mill capacity can be obtained. During this time the swung out milling rollers can be repaired or replaced.

The roller mill safety system according to the invention ensures in continuous manner a full capacity or efficiency of downstream devices, e.g. a rotary kiln, as a result of a corresponding roller mill efficiency.

Compared with the known safety concepts, the roller mill safety system according to the invention is extremely economic and reliable. The greatest economic advantages occur when using the inventive safety system in a cement plant operated in combined form. However, in principle, it can be used in all milling and crushing methods and also in a central milling plant.

The inventive method for the production of cement in a combined plant, in which in a cement raw material plant cement raw material undergoes in a roller mill using milling rollers rolling on a rotary milling surface and accompanied by the supply of waste gases from a heat exchanger or cooler process is subject to milling drying and following classifying and separation of the raw powder from the raw powder-waste gas mixture in a filter and/or cyclone is fed to a preheater and precalciner and a rotary kiln, a roller mill is provided which has more than four milling rollers in a pairwise facing manner for a milling roller-side, almost 100% redundancy. The roller mill is designed in such a way that 80% of the full mill capacity is provided by the four milling rollers.

In order to ensure an extremely high operational reliability during cement production, advantageously six milling rollers are associated with a 3 x 2 roller mill and the raw powder undergoes a milling drying. In accordance with the ...